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**Top:** Paul Trout, a DynCorp employee, installs new avionics hardware into one of NASA's T-38 astronaut training aircraft. The work was taking place in Ellington Field's Hangar 990. **Right:** A prototype ejection seat is suspended above a T-38 in Hangar 135 as, from left, DynCorp's James Lee, Air Force Crew Systems Officer Larry Rogers of Wright-Patterson Air Force Base, and Peter Winwright of seat manufacturer Martin-Baker, monitor the operation. In the foreground is the old ejection seat, which was re-installed after the test. **Below,** the WB-57F crew prepares for a flight in the high-altitude research aircraft. From left are NASA's Scott Reagan, DynCorp's Don Greenway and Luther Levan, Pilot Rick Hull, NASA's Frank Newman, DynCorp's Chris Sanzibal, Systems Engineer Shelley Hilden and NASA's Bud Meins. **Bottom:** DynCorp employee Steven Burris, adjusts new T-38 digital avionics package, comparing its output to the old analog system's.

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# Flying Farther

## Ellington Field workers stretch limits of aging aircraft fleet to ensure safety, support space flight objectives

*[Editor's note: These two articles about are the first segment in a two-part series that looks at Ellington Field's contributions to America's space program and the challenges ahead. Next week: Maintaining and upgrading NASA's T-38 training aircraft fleet.]*

By Elizabeth Soutter

Keeping pace with America's space program is the job of JSC's Aircraft Operations Division at Ellington Field, and today that means both supporting human space flight operations and finding ways to use the ever-expanding technology that springs from them.

As NASA moves from exploring space to finding ways of developing it and living in it permanently, the Aircraft Ops team at Ellington is constantly "pushing the envelope" of its equipment and its human capabilities while embracing commercial advances rooted in space technology.

Aircraft Ops resides on 37 acres at Ellington Field, housing 375 employees in 15 buildings. In addition to the 85 federal employees working at Ellington Field and at the El Paso Forward Operating Location, there are 55 Lockheed Martin employees who develop, test and maintain the Shuttle Training Aircraft simulation system and 235 DynCorp employees who maintain JSC's fleet of 40 aircraft.

"Aircraft Operations exists to support the space shuttle and space station programs through zero-g evaluation and operations testing and to provide flight readiness training and instructing astronaut pilots in landing the orbiter," said Deputy Director of Aircraft Operations David Finney.

The work of Ellington Field personnel is exacting and critical to the safety of the passengers and pilots aboard JSC's aircraft. Workers at Ellington Field maintain, fly and rebuild portions of the planes that are flown by astronauts and instructors every day.

Airplanes in the hangars are peppered with fluorescent orange flags—warnings affixed to hardware to remind crew not to take off without checking them.

"A T-38 engine is turning at 16,000 revolutions per minute. If a worker were to leave a scrap of metal inside an engine, it would ruin it. All it takes is a single pebble to destroy an engine and put people in jeopardy," said T-38 maintenance officer Jose Rangel.

To support its mission, Aircraft Operations maintains 40 aircraft including 30 modified Northrop Grumman T-38 high performance jet aircraft trainers. To maintain flying proficiency, each of 140 astronauts flies approximately 15 hours a month in the T-38s. Each aircraft needs a major maintenance overhaul about every nine months. DynCorp maintenance crews work to keep an average of 22 of these aircraft constantly in service.

NASA owns the first T-38 to come off the assembly line in 1959. T-38s were not manufactured after 1968, so all of NASA's T-38's are at least 29 years old. It is anticipated that Aircraft Ops modifications will keep the T-38's flying until the year 2040—a total of about 72 years. The present record holder for the useful flying life of an aircraft is the DC-3, the last of which was built in 1934 and some of which are still flying. With the advantage of Aircraft Ops care, the T-38 may well eclipse the record.

Ellington workers have made more than 30 modifications to the T-38s in the past several years. Major modifications, being implemented now, will involve new designs and modern hardware additions. Among these are: structural changes to the bulkheads and engine inlets to enhance the aircraft's utility and safety, and changes to enhance pilot operability and make the cockpit safer and more efficient as part of the nearly completed avionics upgrade program. Future modifications include the incorporation of new engine inlets to improve aircraft performance in the event of

engine failure and new ejection seats to accommodate a wider range of air crew.

Ellington's zero-gravity training takes place in the KC-135, familiarly known as the "Vomit The aircraft simulates microgravity by climbing rapidly to an altitude of 32,000 feet and then pushing over to plummet toward the Earth at a rate of 432 miles per hour. At the top of each parabolic curve, occupants experience a free fall that is similar to weightlessness. The speed and repetition of the parabolas can confuse the human inner ear and cause severe motion sickness, hence the aircraft's nickname.

One of the less well-known aircraft at Ellington Field is the WB-57F. Created as a weather reconnaissance aircraft, the WB-57F has been used by NASA recently to test the effects of solid rocket plume gases on the environment. This airplane flies to unusually high altitudes—up to 68,000 feet—where it tests atmospheric gases and ozone. WB-57F pilots operate under a sky turned purple by the thin band of atmosphere between them and the darkness of space. Unlike passengers aboard an airliner that flies no higher than 40,000 feet, passengers aboard this aircraft must wear pressure suits to prevent their blood from boiling.

Ellington Field personnel also have the mission to train astronaut pilots to land the space shuttle orbiter. Four modified Grumman Gulfstream II aircraft, called Shuttle Training Aircraft, are designed to simulate orbiter landings from an altitude of 35,000 feet to touchdown. The interiors of these planes have been modified to the same configuration as the orbiters. An engineer in the back of the plane uses a computer to simulate landing conditions while a pilot instructor and pilot astronaut practice landing the aircraft on shuttle landing runways at the White Sands Test Facility, Edwards Air Force Base and Kennedy Space Center.

Because the orbiter does not have engines for landing, the astronauts must steer the craft to a perfect landing on the first attempt. This unpowered, or "dead stick," landing takes hours of training to perfect.

In addition to its training and test aircraft, Ellington Field also houses a NASA-2 mission management aircraft that transports passengers to other NASA facilities. Two modified Boeing 747 Shuttle Carrier Aircraft also are part of the JSC fleet, although they are housed at Edwards Air Force Base and maintained by a team of DynCorp personnel.

Ellington Field boasts a full compliment of technicians, engineers and mechanics to support its operations. Aircraft Ops personnel are charged with ensuring that the astronauts are provided a safe, efficient and effective training environment. DynCorp was selected as the JSC nominee for the George M. Low Outstanding Contractor Award. Selected for their motivational leadership, outstanding product quality, superb labor standard and imaginative cost savings initiative, DynCorp contractors have been hailed by NASA as superlative.

"By every measure of effectiveness, DynCorp's performance has been worthy of recognition," said Aircraft Operations Division's David Finney. "An unusually high number of astronaut candidates has created a higher demand on DynCorps technicians. The contractors have consistently responded to an increased workload without any increase in cost. Performance, safety, and cost savings have remained at the highest standards, in spite of the highest ever tempo of operations."

Ellington Field has contributed to NASA's mission since the creation of the Manned Spacecraft Center in 1962, but its heritage goes back to the earliest days of aviation. In 1962, NASA obtained a portion of the airfield from the Air Force and began astronaut training operations. Ellington Air Force Base was deactivated in 1976. NASA retained its portion of the airfield, as did several military occupants such as the Texas Air National Guard.